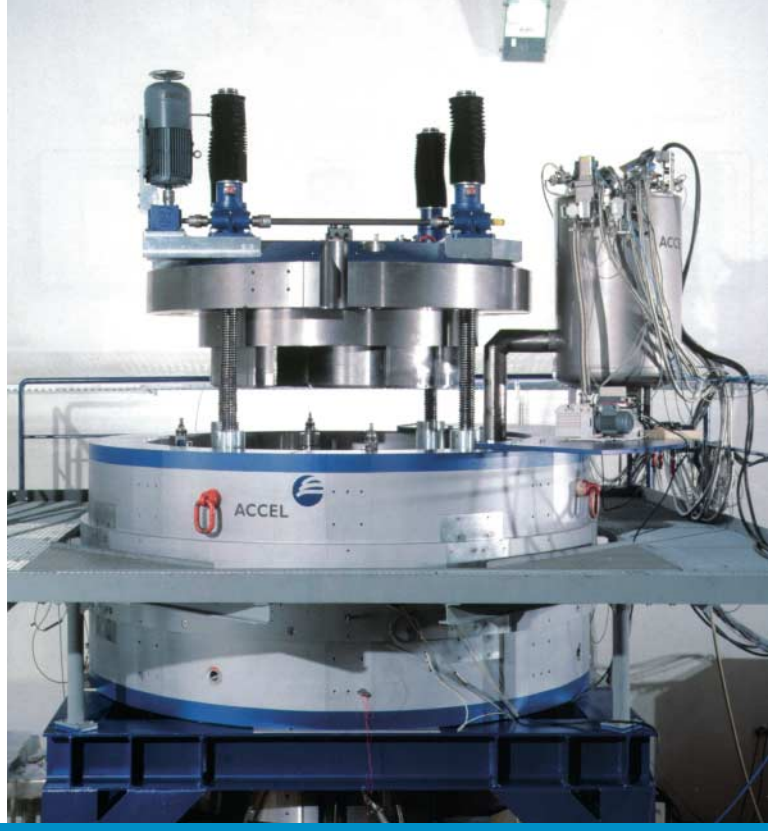
CX1000 supports advanced medical engineering

Innovative, high-tech cancer treatment technique



An innovative proton radiation technique that is more accurate and effective than conventional radiotherapy is increasingly being used for cancer treatment. At the Munich-based Rinecker Proton Therapy Center (RPTC), proton irradiation equipment is controlled using BX3100 Bus Terminal Controllers and CX1000 Embedded PCs from Beckhoff.

A common aspect of X-rays and proton rays is that they can be focused very accurately. The main difference is that the range of protons can also be controlled very accurately. This is due to the fundamentally different physical properties of electromagnetic waves (X-rays) and accelerated nuclear particles (protons). Proton rays release the majority of their energy at a specified penetration depth in the affected tissue. The advantage compared with conventional radiotherapy is the absence of undesirable scatter: The treatment, therefore, has much less effect on non-affected organs than traditional cancer treatments. What's more, the energy density at the focus of the tumor is significantly higher than in conventional photon treatment and the prospects for curing the disease are better.

The equipment for the first European proton radiation center for outpatient treatment of cancer tumors was supplied by Accel Instruments GmbH, based in Bergisch-Gladbach, Germany. In a particle accelerator (cyclotron), protons with strong electromagnetic fields are accelerated along a spiral to 60 % of the speed of light, i.e. 180,000 km per second. When the protons have reached the desired speed, they are deflected via an electric field and leave the cyclotron in a straight line.

In order to ensure that the proton ray reaches its target precisely, 182 deflection and guide units guide the ray directly into the cancerous tissue. The proton ray travels inside an approx. 160 m long evacuated stainless steel tube system. For monitoring the vacuum in the tube system, five independent measuring systems are controlled and analyzed via a BX3100 Beckhoff Bus Terminal Controller with PROFIBUS interface. BX3100 communication terminals with KL6001 serial RS232 interface are used for data acquisition purposes.

The deflection and guide units consist of special electromagnets that are controlled via high-precision power supply units. 10 CX1000 Embedded PCs, each with two RS422 interfaces, are used for continuous communication with the power supply units for the electromagnets. To this end, data packets are exchanged between the CX1000 and the coupled power supply units with a cycle time of 2 ms. This means that very fast calculations and a very high data throughput are required. Compliance with these criteria was the crucial factor for the decision to use Beckhoff technology. "Our customer appreciates the perfect interaction of hardware and software from Beckhoff," Uwe Behrens, freelance consultant for Accel, said. "Efficient co-operation with Beckhoff was invaluable for our project!"

→ Accel Instruments GmbH **www.accel.de**

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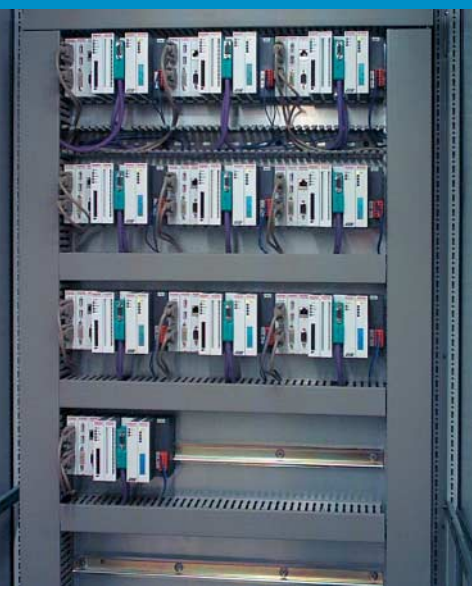

CX1000 Embedded PCs control the deflection and guide units.

Deflection and guide units for the proton ray (detail).